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DECLARATION

The undersigned, Jan McLin Clayberg, having an office at 5316 Little Falls Road, Arlington, VA 22207-1522, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of International Patent Application PCT/DE 2006/050024 of ZAISER, A., ET AL., entitled "HANDHELD POWER SAW".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

Jan McLin Clayberg

HANDHELD POWER SAW

Prior Art

The invention is based on a handheld power saw as generically defined by the preamble to claim 1, a handheld power saw as generically defined by the preamble to claim 7, and a saw blade for a handheld power saw as generically defined by the preamble to claim 12.

From British Patent saw blade 2 380 706 A, a handheld power saw with a saw blade that moves in oscillating fashion in a first direction is known. For holding and driving the saw blade, the handheld power saw includes a coupling means, by which the saw blade is connected to a lifting rod, which is driven in linearly oscillating fashion via an eccentric device. An oscillating motion of the saw blade is guided indirectly via a guide assembly for guiding the lifting rod.

Advantages of the Invention

The invention is based on a handheld power saw, having a coupling means for retaining and driving a saw blade, and having a guide assembly for guiding an oscillating motion of the saw blade.

It is proposed that the guide means includes at least one lateral bracing means for shielding the coupling means from shear forces acting on the saw blade. As a result, a secure hold of the coupling means even at major shear forces can be assured, so that in particular it becomes possible to make the handheld power saw usable in a simple, economical way for the use of especially long saw blades, especially blades for back saws. Forces acting on the coupling means can be

shielding against, so that the coupling means can be designed especially inexpensively. It can also be attained that the saw blade on being installed or secured is guided to the coupling means by the lateral bracing means. Greater comfort can be gained thereby. This last advantage is especially important in self-clamping coupling means, since in that case, because of the guidance properties of the lateral bracing means, blind installation, or installation without visual contact on the part of the user with the coupling means can be achieved.

The term shear forces should be understood in this context to mean forces with a component that is directed both perpendicular to a direction of the oscillating motion of the saw blade and perpendicular to a direction of the cutting edge of the saw blade. Hence shear forces have one component in particular that is perpendicular to a face of the saw blade. In this connection, a bracing means should be understood as a "lateral bracing means", if it is intended to brace the saw blade in a central region of a side face of the saw blade.

Effective shielding from the shear forces can be attained if the bracing means extends over at least 2 cm and even better over 3 to 4 cm, since then a transmission of the shear forces can be avoided by a lever action of the saw blade. Transmission of a bending tension by the bracing means can be avoided if the bracing means prevents sagging of the saw blade in a guide region thereof, so that a bending tension of the saw blade is braced in an entry region of the bracing means.

In a refinement of the invention, it is proposed that the bracing means is embodied as a slide bearing. As a result, an especially economical support of the saw blade with simultaneous shielding of the coupling means can be attained. Slide bearings that include self-lubricating sintered components are especially suitable. In principle, however, embodiments of the invention are also conceivable

in which the bracing means is embodied as a needle bearing or roller bearing.

If the bracing means is intended for bracing the saw blade on both sides, then advantageously shear forces can be braced in two opposite directions.

A further gain in comfort upon coupling the saw blade to the handheld power saw can be made possible if the coupling means is embodied as a detent coupling. The detent coupling can especially advantageously be designed as a self-locking detent connection, which acts in a longitudinal direction of the saw blade.

Effective shielding of the coupling means can be attained if the bracing means forms a two-dimensional contact face. As a result, both bending and torsional forces can effectively be shielded against, especially whenever the saw blade in operation is located between two parallel contact faces.

Secure shielding with a sufficiently slight contact pressure of the contact faces can be achieved if the contact face has a length of at least 2 cm in a longitudinal direction of the saw blade. Favorable force ratios can be attained if the length makes up at least half of a width of a saw blade to be fastened in place.

To shield against shear forces, the saw blade, under the influence of such shear forces, advantageously rests laterally in at least two and optionally even three regions of the guide assembly.

Moreover, the invention is based on a handheld power saw, having a housing, having a contact element for bracing the housing on a workpiece, and having a saw blade, movable in oscillating fashion in a first direction, with at least one cutting edge pointing in a working direction.

It proposed that the contact element is supported displaceably relative to the housing. As a result, a contact element that can be adapted flexibly to circumstances can be attained that is simple to displace out of a problematic position in the event of a problem. In particular, flush cutting into a corner is feasible, and the corner may be formed by a work face of the workpiece and by an object protruding from that work face.

The term "displaceably supported" should be understood in this connection to pertain to any component that is movable in a straight line in one or two dimensions.

Flush cutting into a corner with simultaneously good guidance properties of the handheld power saw on the workpiece can be attained if the contact element is displaceable, with a front edge pointing in the working direction, at least as far as a height of the cutting edge. The term "working direction" is understood to mean a direction in which the handheld power saw is moved by a user during a cutting operation.

An at least three-sided, secure bracing of the handheld power saw on the workpiece can be attained if the contact element has a recess that is open in the working direction, or if the contact element embraces the saw blade in the installed state on at least three sides.

An additional gain in comfort can be attained if the handheld power saw includes a spring element for restoring the contact element to a position of repose.

An unintended displacement of the contact element can be avoided if the handheld power saw has a detent element for locking the contact element in a

detent position. The detent position can be distinguished especially by the fact that the contact element in the detent position shields the hand of the user, resting on a hand contact face, from the saw blade, thus preventing injuries. To shield two different hand contact faces, the contact element can advantageously be displaced as a function of a hand contact face selected by the user or as a function of a sawing function selected by the user, so that secure protection is always attainable. Sawing functions may for instance be a saber saw function and a backsaw sawing function.

The invention is also based on a saw blade for a handheld power saw, having an oscillatory drive mechanism, and in which the saw blade includes a retention region which is intended for connection with a coupling means of the handheld power saw.

It is proposed that the handheld power saw has a guide region for contact of a lateral bracing means of the handheld power saw. As a result, it can be attained that shear forces on the saw blade in the guide region are braced and cannot burden the coupling means. The coupling means can as a result be designed inexpensively and yet safely.

A light cut involving less expenditure of force can be attained by means of an only slight thickness in the region of a cutting edge of the saw blade. Great rigidity of the guide region can nevertheless be attained if the guide region has a greater thickness of material than a work region with a cutting edge. The guide region can as a result be equipped especially for bracing major rolling forces oriented in a plane of the saw blade or parallel to the working direction.

Breakage of the saw blade at the connecting seam between the guide region and the work region can be reliably avoided if the guide region and the work region

are joined by a laser welding process.

Drawings

Further advantages will become apparent from the ensuing description of the drawings. In the drawings, exemplary embodiments of the invention are shown. The drawings, description and claims include numerous characteristics in combination. One skilled in the art will expediently consider the characteristics individually as well and put them together to make useful further combinations.

Shown are:

Fig. 1, a handheld power saw with an oscillatingly driven saw blade;

Fig. 2, in longitudinal section, a guide device of the handheld power saw for guiding an oscillating motion of the saw blade;

Fig. 3, in cross section, the guide device of Fig. 2;

Fig. 4, a lateral bracing means of the guide device from Figs. 2 and 3;

Fig. 5, a saw blade of the handheld power saw of Figs. 1-4;

Fig. 6, in an inside view, an actuation slide for releasing the saw blade of the handheld power saw;

Fig. 7, an inside view of a coupling means of the handheld power saw with the actuation slide of Fig. 6; and

Fig. 8, an alternative handheld power saw, having a housing and having a contact element for bracing the housing.

Description of the Exemplary Embodiments

Fig. 1 shows a handheld power saw, embodied as a back saw with an additional saber saw function, with an oscillatingly driven saw blade 12a, which is shown as a representative of a large assortment of saw blades that can be held and driven on the handheld power saw via a coupling means 10a (Fig. 2). A guide assembly 14a for guiding an oscillating motion 16a of the saw blade 12a in one direction 26a is located in a housing 20a of the handheld power saw.

The handheld power saw 20a has two grip regions 76a, 78a, equipped with a surface with a good grip, specifically a first, D-shaped grip region 76a with a start button 82a and a second, front grip region 78a above the saw blade 12a. The start button 82a is located on a grip bar, inclined by approximately 45θ to the direction 26a, of the first grip region 76a. To prevent the user's hand from slipping off the second grip region 78a unintentionally in a region of the saw blade 12a, the housing 20a has a hornlike protrusion 98a, in which a circuit board is located for wiring two light- emitting diodes 84a, 84a' that are located in the protrusion 98a and illuminate the saw blade 12a.

The guide assembly 14a includes a pressure roller 52a, supported in sliding fashion on a bolt 50a, and a pressure bolt 68a for guiding the saw blade 12a in the direction 26a of the oscillating motion 16a of the saw blade 12a. The direction 26a corresponds to a longitudinal direction of the saw blade 12a. The guide assembly 14a also includes two bracing means 18a, which in the installed state of the saw blade 12a are located mirror-symmetrically beside the saw blade 12a. The bracing means 18a are provided for guiding the saw blade 12a in a plane of the saw blade

12a and for shielding the coupling means 10a of the handheld power saw from shear forces acting on the saw blade 12a perpendicular to its two-dimensional extent.

The coupling means 10a serves to connect the saw blade 12a to a lifting rod 64a, which is driven to oscillate linearly, via an eccentric device 66a, by a drive mechanism 38a of the handheld power saw, the drive mechanism being embodied as an electric motor.

The lifting rod 64a has a first, flat part 54a and a second, tubular part 58a, which is supported resiliently on the first part 54a in the direction 26a via a spring 56a. The first part 54a has an oval recess, not shown here, which is engaged by an eccentric pin of the eccentric device 66a via a bearing. The coupling means 10a is located on a front end of the second part 58a.

The coupling means 10a includes a clamping sleeve 60a, with a slotlike opening, not shown here, into which upon assembly a T-shaped extension 62a of a retaining region 40a of the saw blade 12a is inserted. Twisting the clamping sleeve 60a causes it to engage a crossbeam of the extension 62a from behind, thus fixing the saw blade 12a axially on the lifting rod 64a. The twisting of the clamping sleeve 60a is effected automatically by a restoring spring 70a, so that the coupling means 10a is embodied as a detent coupling. For automatic twisting of the clamping sleeve 60a upon insertion of the extension 62a, the clamping sleeve 60a may have an oblique sliding face. The coupling means 10a is suitable for receiving known saber saw blades with an end region, toward the fastening side, that is analogous to the extension 62a.

For releasing the coupling means 10a, the handheld power saw includes a slide 94a, which is resiliently and displaceably connected to the housing 20a and

which has a pressure edge 96a that protrudes into the housing 20a and that by a displacement of the slide 94a in each reciprocating position of the lifting rod 64a can be brought into contact (Figs. 6 and 7) with a finlike engagement element, not shown here, of the clamping sleeve 60a.

A stroke of the handheld power saw or of the oscillating motion 16a is 23 mm long. As a result, the clamping sleeve 60a can be rotated by 90θ, so that its slotlike opening extends parallel to the saw blade 12a, and the saw blade 12a can be removed from the coupling means 10a by the user.

The housing 20a has a transparent region 74a all around the coupling means 10a that allows visual monitoring of locking of the saw blade 12a in the coupling means 10a.

An air flow from a fan wheel 88a, secured to an armature shaft 86a of the drive mechanism 38a is guided by an air conduit 90a through the transparent region 74a and emerges from the housing 20a through lateral openings 92a located next to the saw blade 12a. As a result, chips are prevented from penetrating into the region 74a, and chips are blown out of a work region.

The lateral bracing means 18a, 18a' (Figs. 3 and 4) are intended for bracing the shear forces on both sides and are made from graphite-containing, lubricant-filled sintered bronze. The bracing means 18a, 18a' therefore form a slide bearing for displaceably supporting the saw blade 12a in the plane defined by the saw blade 12a. By means of a rounded area 72a in a front region of both bracing means 18a, 18a', the bracing means 18a, 18a' simultaneously guide an insertion motion of the saw blade 12a.

The bracing means 18a and the bracing means 18a' mirror-symmetrical to it

each form a two-dimensional contact face 46a for the saw blade 12a, with a length 48a of 3 cm in the direction 26a. The contact faces 46a stiffen the saw blade 12a in a guide region 42a, located between the retaining region 40a and a work region 44a that is equipped with a cutting edge 30a, and they brace against shear forces acting on the work region 44a so that these forces cannot be transmitted into the retaining region 40a and thus to the coupling means 10a. The cutting edge 30a has crossed toothing.

The saw blade 12a shown in Fig. 5 has the retaining region 40a, the guide region 42a, and the work region 44a. The retaining region 40a and the guide region 42a have a material thickness of 1.2 mm, while the work region 44a has a material thickness of 0.9 mm. The guide region 42a is stamped together with the retaining region 40a out of a steel sheet, while the work region 44a is joined to the guide region 42a by a laser welding process. The coupling means 10a, however, is also suitable for holding saw blades of constant material thickness throughout.

Fig. 8 shows a handheld power saw in a second embodiment of the invention. In the description, it will essentially be the differences from the exemplary embodiment shown in Figs. 1-7 that are addressed, while for characteristics that remain the same, reference is made to the description of the exemplary embodiment of Figs. 1-7. Analogous characteristics are identified by the same reference numerals, but to distinguish between the exemplary embodiments the letters "a" and "b" are added.

The handheld power saw shown in Fig. 8 includes a housing 20b, with a contact element 22b, supported displaceably relative to the housing 20b, for bracing the housing 20b on a workpiece. The contact element 22b is supported on a rail, not shown here, and is displaceable, with a front edge 32b pointing in the working direction 28b, as far as the height of a cutting edge 30b of an oscillatingly

movable saw blade 12b. The saw blade 12b, in the installed state, reaches through a central, slotlike recess 34b of the contact element 22b, which recess is open in the working direction 28b.

A spring element 36b automatically restores the contact element 22b to a position of repose, shown in Fig. 8, in which a user's hand, resting on a lower, transparent region 74b, is shielded from the saw blade 12b by the contact element 22b. The position of repose is at the same time a detent position, in which the contact element 22b automatically locks by means of a detent element 24b.

If a user wants to saw flush against a corner with the cutting edge 30b, he can release the detent element 24b, by an unlocking means 80b located on a second grip region 78b, so that the contact element 22b can be deflected out of its position of repose, counter to the working direction 28b and counter to the force of the spring element 36b, when the front edge 32b strikes the corner. The contact element 22b then shields a user's hand resting in the second grip region 78b.